

1.0 INTRODUCTION

1.1 PREVIOUS ACTIONS

In this EA, the DOE reports the results of an analysis of the potential environmental impacts from proposed upgrades and operation of the CEBAF and FEL accelerators as well as construction and use of buildings associated with TJNAF's 2005 Ten-Year Site Plan.¹

On January 12, 1987, DOE issued a finding of no significant impact (FONSI) based on an EA of the proposed construction and operation of CEBAF (DOE/EA-0257). Construction was completed in early 1995. Commissioning of components paralleled construction activities so that the accelerator began operating to serve the DOE physics program in late 1995. It has continued operating to this day.

In the 1987 EA, the proposed action for which impacts were evaluated was the operation of CEBAF to produce an electron beam energy in the range from 0.5 to 4.0 GeV with a maximum beam power of 1000 kW (1 MW). CEBAF produces an electron beam for experiments in basic nuclear physics, in particular, for the study of quark structures and behaviors and the forces that govern the clustering of nucleons in the atomic nucleus.

In 1997, in accordance with the DOE National Environmental Policy Act (NEPA) regulation, a new EA (DOE/EA-1204) was completed to review the environmental, health, and safety impacts of changing the range of operating parameters of the CEBAF and constructing and operating the FEL within certain operating parameters. On November 5, 1997, DOE issued a FONSI based on the 1997 EA. DOE found that the proposed action did not have the potential for causing significant impacts, as was also concluded in the 1987 FONSI. Thus, DOE concluded that no further NEPA review was necessary for either the change in operating parameters of CEBAF, including increasing the energy range up to 8.0 GeV at a maximum beam power of 1000 kW, or for the operation of the FEL with 10 kW UV (ultraviolet) or 20 kW IR (infrared) laser beams for experimental use.

In a third EA (DOE/EA-1384), impacts were evaluated for the construction of various site improvements and the proposed installation and operation of the High-Energy Lithography Source (Helios) accelerator in the FEL addition. It was determined that the proposed improvements at Jefferson Lab did not constitute a major Federal action that would significantly affect the quality of the human environment within the context of NEPA, and a FONSI was issued on July 13, 2002.

1.2 SCOPE OF THIS PROPOSED ACTION

The proposed action evaluated in this EA involves addressing further changes in the operating parameters of the CEBAF and FEL accelerators. With this proposal, DOE intends to increase the maximum beam energy of CEBAF from 8.0 GeV to 16.0 GeV and increase the beam power from 1 MW to a maximum of 2 MW in the recirculating linear accelerator (linac) section of CEBAF, with a maximum beam power of 1 MW at both HPBDs simultaneously. DOE intends to increase the FEL accelerator beam power from 1.6 MW to 22 MW and the IR laser beam

¹ TJNAF 2005. Ten - Year Site Plan FY 2007 – FY 2016.
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power of 50 kW (operations) to a range of 100 kW to 190 kW and the UV beam from 2 kW to 20 kW.

The proposed action also involves expansion of the CHL and three existing service buildings to support the CEBAF upgrade; addition of a fourth experimental hall (Hall D) with its counting house and associated service buildings; excavation/construction of two retention ponds and their associated storm water channels; construction of a Technical Support Building; construction of a radioactive waste storage structure and several general site storage structures; expansion of Accelerator Site utilities including the construction of a 10 MW generator and pad; and construction of the North Connector Road extension and parking lot. The majority of these actions take place on the Accelerator Site (a fenced radiological area) that contains both the CEBAF and FEL accelerators, and the CEBAF experiment halls and support buildings. The remainder of the Jefferson Lab site is denoted as “the campus.”

DOE has prepared this EA to determine the potential for adverse impacts from increased radiation produced with the upgraded operation of CEBAF and FEL and from increased resource use, disturbance of land from construction, effects on the offsite population, and other sources of potential impact.

1.3 PURPOSE AND NEED FOR ACTION

The Jefferson Lab facilities were originally built to support the 4.0 GeV program and allowed marginal user and limited technical support space with no planned future growth.

The facilities were expanded slightly to support the now 8.0 GeV program, but the site still provides limited technical support work areas even though there has been continual growth of our physics program. The proposed actions under this EA facilitate existing operations in addition to addressing the planned upgrades of CEBAF and FEL.¹

The proposed accelerator upgrades will enable Jefferson Lab to expand its research capabilities. Experiments that may be conducted at beam energies above the current 8.0 GeV limit, using a continuous electron beam accelerator, would take decades to complete at other U.S. electron beam facilities, because they operate with a pulsed beam, which generates data at a rate 1000 times slower than the continuous beam option of CEBAF. The upgraded CEBAF is critical to obtaining insights into the hadronic and quark/gluon description of matter. These scientific opportunities have been identified as one of the highest priorities by the Nuclear Science Advisory Committee (NSAC) and have also been endorsed by the National Academy of Sciences. The addition of Experimental Hall D will allow CEBAF to map the spectrum of gluonic excitations starting with exotic hybrids.

The FEL upgrade is necessary for: industrial applications; studies by our Laser Processing Consortium (LPC) partners for high volume processes such as surface modification of metals and polymers; improving the capability to perform fundamental medical measurements and material property studies; and, as well, partnering with the Navy to further tune IR FEL radiation to the windows in the atmospheric spectrum where there is minimal absorption.

The purpose of the proposed action is to continually improve Jefferson Lab’s capability to expand its research capabilities.